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Lab-on-a-chip mediated gene extraction via gold coated needles

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Gene expression analysis requires mRNA extraction from cells and tissues. Current multi-step methods for RNA extraction begin with lysis of a bulk cell population or tissue biopsy to remove the biological material. During this process, the target mRNA is at risk for contamination by DNA or other cellular components. Subsequent purification reduces the quantity of mRNA which has an impact on its downstream applications. We here report an alternative single-step technique that uses gold-plated acupuncture needles and a lab-on-a-chip (LOC) microdevice. This method automates the collection, purification, and reverse transcription (RT) of the mRNA from a precisely-defined area of the biological sample. Thiol modified dT (15) oligos were immobilized to the needles (130 μm diameter) via gold-thiol linkage chemistry. By inserting a needle into a sample for 60 seconds, the mRNA is selectively hybridized to the dT (15) sequences. The LOC device has a 254 μM high channel formed using PDMS sheet sandwiched between two 25 mm x 75 mm glass slides. The dimensions of the microfluidic channel 33 mm x 1 mm and the temperature of the RT mixture was maintained at 42 ˚C via external heating element. Following mRNA hybridization, the needle was inserted through the PDMS and incubated for 5 minutes. The mRNA was released and reverse transcribed in the channel, collected at the outlet and amplified via PCR reaction. Method for automatic mRNA extraction and reverse transcription via gold plated needles in LOC device was successfully developed and tested. Future applications of the technology will include its integration with lab-on-a-chip PCR system.

Biography

Gergana G Nestorova received her PhD degree in Molecular Science and Nanotechnology from Louisiana Tech University in 2014. She is currently Research Assistant Professor at Louisiana Tech University. Her current research interests include lab-on-a-chip biosensors with applications in biomedical research.

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